UNITED
NATIONS

A

General Assembly

Distr.
LIMITED

A/CONF.151/PC/WG.I/L.45
30 March 1992

ORIGINAL: ENGLISH

PREPARATORY COMMITTEE FOR THE UNITED
NATIONS CONFERENCE ON ENVIRONMENT
AND DEVELOPMENT
Fourth session
New York, 2 March-3 April 1992
Working Group I
Agenda item 5

ENVIRONMENTALLY SOUND MANAGEMENT OF BIOTECHNOLOGY

Text submitted by the Chairman on the basis of negotiations held on document A/CONF.151/PC/100/Add.27

(Section II, chapter 8, of Agenda 21)

INTRODUCTION

1. Biotechnology is the integration of the new techniques emerging from modern biotechnology with the well-established approaches of traditional biotechnology. Biotechnology, an emerging knowledge-intensive field, is a set of enabling techniques for bringing about specific man-made changes in deoxyribonucleic acid (DNA), or genetic material, in plants, animals and microbial systems leading to useful products and technologies. By itself biotechnology cannot resolve all the fundamental problems of environment and development, so expectation needs to be tempered by realism. Nevertheless, it promises to make a significant contribution in enabling the development of, for example, better health care, enhanced food security through sustainable agricultural practices, improved supplies of potable water, more efficient industrial development processes for transforming raw materials, support for sustainable methods of afforestation and reforestation, and detoxification of hazardous wastes. Biotechnology also offers new opportunities for global partnerships, especially between the countries rich in biological resources (which include genetic resources) but lacking the expertise and investments needed to apply such resources through biotechnology and the countries that have developed the technological expertise to transform biological resources so that they serve the needs of sustainable development. Biotechnology can assist in the conservation of those resources through, for example, ex situ

techniques. The programme areas set out below seek to foster internationally agreed principles to be applied to ensure the environmentally sound management of biotechnology, to engender public trust and confidence, to promote the development of sustainable applications of biotechnology and to establish appropriate enabling mechanisms, especially within developing countries, through the following activities:

(a) Increasing availability of food, feed and renewable raw materials;

(b) Improving human health;

(c) Enhancing protection of the environment;

(d) Enhancing safety and developing international mechanisms for cooperation;

(e) Establishing enabling mechanisms for the environmentally sound application of biotechnology.

PROGRAMME AREAS

A. Increasing the availability of food, feed and renewable raw materials

Basis for action

2. To meet the growing consumption needs of the global population, the challenge is not only to increase food supply, but also to improve food distribution significantly while simultaneously developing more sustainable agricultural systems. Much of this increased productivity will need to take place in developing countries. It will require the successful and environmentally safe application of biotechnology in agriculture, in the environment and in human health care. Most of the investment in modern biotechnology has been in the industrialized world. Significant new investments and human resource development will be required in biotechnology, especially in the developing world.

Objectives

3. The following objectives are proposed, keeping in mind the need to promote the use of appropriate safety measures based on programme area D:

(a) To increase to the maximum possible extent the yield of major crops, livestock, and aquaculture species, by using the combined resources of modern biotechnology and conventional plant/animal/micro-organism improvement, including the more diverse use of genetic material resources, both hybrid and original. Forest product yields should similarly be increased, to ensure the sustainable use of forests;

(b) To reduce the need for volume increases of food, feed and raw materials by improving the nutritional value (composition) of the source crops, animals and micro-organisms, and to reduce post-harvest losses of plant and animal products;

(c) To increase the use of integrated pest, disease and crop management techniques to eliminate overdependence on agrochemicals, thereby encouraging environmentally sustainable agricultural practices;

(d) To evaluate the agricultural potential of marginal lands in comparison with other potential uses, for example, in forestry and conservation, and in those areas where agricultural use is desirable, to develop systems allowing for substantial and sustainable productivity increases;

(e) To expand the applications of biotechnology in forestry, both for increasing yields and more efficient utilization of forest products and for improving afforestation and reforestation techniques. Efforts should be concentrated on species and products that are grown in and are of value for developing and other countries;

(f) To increase the efficiency of nitrogen fixation and mineral absorption by the symbiosis of higher plants with micro-organisms;

(g) To improve capabilities in basic and applied sciences and in the management of complex interdisciplinary research projects.

Activities

(a) Management related

4. Governments at the appropriate level, with the assistance of international and regional organizations and [,where necessary,] with the support of non-governmental organizations, the private sector, academic and scientific institutions and the pharmaceutical industry, should improve both plant and animal breeding and micro-organisms through the use of traditional and modern biotechnologies, to enhance sustainable agricultural output to achieve food security, particularly in developing countries, with due regard to the prior identification of desired characteristics before modification, taking into account the needs of farmers, the socio-economic, cultural and environmental impacts of modifications and the need to promote sustainable social and economic development and paying particular attention to how the use of biotechnology will impact on the maintenance of environmental integrity.

5. More specifically, these entities should:

(a) Improve productivity, nutritional quality and shelf-life of food and animal feed products, with efforts including work on pre- and post-harvest losses;

(b) Further develop resistance to diseases and pests;

(c) Develop plant cultivars tolerant and/or resistant to stress from factors such as pests and diseases and from abiotic causes;

(d) Promote the use of underutilized crops of possible future importance for human nutrition and industrial supply of raw materials;

(e) Increase the efficiency of symbiotic processes that assist sustainable agricultural production;

(f) Facilitate the conservation and safe exchange of plant, animal and microbial germ plasm by applying risk assessment and management procedures, including improved diagnostic techniques for detection of pests and diseases by better methods of rapid propagation;

(g) Develop improved diagnostic techniques and vaccines for the prevention and spread of diseases and for rapid assessment of toxins or infectious organisms in products for human use or livestock feed;

(h) Identify more productive strains of fast-growing trees, especially for fuel wood, and develop rapid propagation methods to aid their wider dissemination and use;

(i) Evaluate the use of various biotechnology techniques to improve the yields of fish, algal and other aquatic species;

(j) Promote sustainable agricultural output by strengthening and broadening the capacity and scope of existing research centres to achieve the necessary critical mass through encouragement and monitoring of research into the development of biological products and processes of productive and environmental value that are economically and socially feasible, while taking safety considerations into account;

(k) Promote the integration of appropriate and traditional biotechnologies for the purposes of cultivating genetically modified plants, rearing healthy animals and protecting forest genetic resources;

(l) Develop processes to increase the availability of materials derived from biotechnology for use in food, feed, and renewable raw materials production.

(b) Data and information

6. The following activities should be undertaken:

(a) Consideration of comparative assessments of the potential of the different technologies for food production, together with a system for assessing the possible effects of biotechnologies on international trade in agricultural products;

(b) Examination of the implications of the withdrawal of subsidies and the possible use of other economic instruments to reflect the environmental costs associated with the unsustainable use of agrochemicals;

(c) Maintenance and development of data banks of information on environmental and health impacts of organisms to facilitate risk assessment;

(d) Acceleration of technology acquisition, transfer and adaptation by developing countries to support national activities that promote food security.

(c) International and regional cooperation and coordination

7. Governments at the appropriate level, with the support of relevant international and regional organizations, should promote the following activities in conformity with international agreements or arrangements on biological diversity as appropriate:

(a) Cooperation on issues related to conservation of, access to, and exchange of germ plasm; rights associated with intellectual property and informal innovations including farmers' and breeders' rights; access to the benefits of biotechnology; and bio-safety;

(b) Promotion of collaborative research programmes, especially in developing countries, to support activities outlined in this programme area, with particular reference to cooperation with local and indigenous communities in the conservation of biological diversity and sustainable use of biological resources, as well as the fostering of traditional methods and knowledge of such groups in connection with these activities;

(c) Acceleration of technology acquisition, transfer and adaptation by developing countries to support national activities that promote food security, through the development of systems for substantial and sustainable productivity increases that do not damage or endanger local ecosystems;

(d) Develop appropriate safety procedures based on programme area D, taking account of ethical considerations.

Means of implementation

(a) Financing and cost evaluation

8. [The estimated average annual cost of this programme area for the period 1993-2000 could be upwards of $5 billion, of which it is estimated that about $50 million would come from international financing sources. Most of the amount for this programme area is included in the cost evaluation of other chapters. Both the total amount and the proportion of global investments currently being made by developing countries in biotechnology research and development need to be increased significantly over the period 1993-2000 and beyond to enable them to take advantage of the increasing opportunities offered by biotechnology for accelerated development.]

(b) Scientific and technological means

9. See paragraphs 6 and 7 above.

(c) Human resource development

10. Training of competent professionals in the basic and applied sciences at all levels (including scientific personnel, technical staff and extension workers) is one of the most essential components of any programme of this kind. Creating awareness of the benefits and risks of biotechnology is essential. Given the importance of good management of research resources for the successful completion of large multidisciplinary projects, continuing programmes of formal training for scientists should include managerial training. Training programmes should also be developed, within the context of specific projects, to meet regional or national needs for comprehensively trained personnel capable of using advanced technology to reduce the "brain drain" from developing to developed countries. Emphasis should be given to encouraging collaboration between and training of scientists, extension workers and users to produce integrated systems. Additionally, special consideration should be given to the execution of programmes for training and exchange of knowledge on traditional biotechnologies and for training on safety procedures.

(d) Capacity-building

11. [Institutional upgrading or other appropriate measures will be needed to build up technical, managerial, planning and administrative capacities at the national level to support the activities in this programme area. Such measures should be backed up by international, scientific, technical and financial assistance adequate to facilitate technical cooperation and raise the capacities of the developing countries. Programme area E contains further details.]

B. Improving human health

Basis for action

12. The improvement of human health is one of the most important objectives of development. The deterioration of environmental quality, notably air, water and soil pollution due to toxic chemicals, hazardous wastes, radiation and other sources, is a matter of growing concern. This degradation of the environment resulting from inadequate or inappropriate development has a direct negative effect on human health. Malnutrition, poverty, poor human settlements, lack of good-quality potable water and inadequate sanitation facilities add to the problems of communicable and non-communicable diseases. As a consequence, the health and well-being of people are exposed to increasing pressures.

Objectives

13. The main objective of this programme area is to contribute, through the environmentally sound application of biotechnology to an overall health programme, to:

(a) Reinforcing or inaugurating (as a matter of urgency) programmes to help combat major communicable diseases;

(b) Promoting good general health among people of all ages;

(c) Developing and improving programmes to assist in specific treatment of and protection from major non-communicable diseases;

(d) Developing and strengthening appropriate safety procedures based on programme area D, taking account of ethical considerations;

(e) Creating enhancing capabilities for carrying out basic and applied research and for managing interdisciplinary research.

Activities

(a) Management-related activities

14. Governments at the appropriate level, with the assistance of international and regional organizations, academic and scientific institutions, and the pharmaceutical industry, should:

(a) Develop national and international programmes for identifying and targeting those populations of the world most in need of improvement in general health and protection from diseases;

(b) Develop criteria for evaluating the effectiveness and the benefits and risks of the proposed activities;

(c) Establish and enforce screening, systematic sampling and evaluation procedures for drugs and medical technologies with a view to barring the use of those which are unsafe drugs for the purposes of experimentation; [ensure that new fertility-related mechanisms and agents are safe and effective and that they do not threaten human health;]

(d) Improve, systematically sample and evaluate drinking-water quality by introducing appropriate specific measures, including diagnosis of water-borne pathogens and pollutants;

(e) Develop and make widely available new and improved vaccines against major communicable diseases that are efficient and safe and offer protection with a minimum number of doses, including the vaccines needed to combat common diseases of children;

(f) Develop biodegradable delivery systems for vaccines that eliminate the need for present multiple-dose schedules, facilitate better coverage of the population and reduce the costs of immunization;

(g) Intensify efforts to develop a multicomponent vaccine conferring protection against common diseases of children;

(h) Develop effective biological control agents against disease-transmitting vectors, such as mosquitoes and resistant variants, taking account of environmental protection considerations;

(i) Develop new diagnostics based on, for example, monoclonal antibodies and DNA probes to enable early detection of communicable, non-communicable and genetic disorders;

(j) Develop and facilitate the therapeutic use of recombinant hormones, produced using recombinant DNA technology;

(k) Develop new drugs for resistant organisms and for metabolic disorders;

(l) Develop improved delivery systems for the administration of therapeutics and prophylaxis;

(m) Develop safe and effective methods for the treatment of genetic disorders;

(n) Develop the improvement and more effective utilization of medicinal plants and other related sources;

(o) Develop processes to increase the availability of materials derived from biotechnology, for use in improving human health.

(b) Data and information

15. The following activities should be undertaken:

(a) Research to assess the comparative social, environmental and financial costs and benefits of different technologies for basic and reproductive health care within a framework of universal safety and ethical considerations;

(b) Development of public education programmes directed at decision makers and the general public to encourage awareness and understanding of the relative benefits and risks of modern biotechnology, according to ethical and cultural considerations.

(c) International and regional cooperation and coordination

16. Governments at the appropriate levels, with the support of relevant international and regional organizations, should:

(a) Develop and strengthen appropriate safety procedures based on programme area D, taking account of ethical considerations;

(b) Support the development of national programmes, particularly in developing countries, for improvements in general health, especially protection from major communicable diseases, common diseases of children and disease-transmitting factors.

Means of implementation

17. [To achieve the above goals, the activities need to be implemented with urgency if progress towards the control of major communicable diseases is to be achieved by the beginning of the next century. The spread of some diseases to all regions of the world calls for global measures. For more localized diseases, regional or national policies will be more appropriate. The achievement of goals calls for:

(a) Continuous international commitment;

(b) National priorities with a defined time-frame;

(c) Scientific and financial input at global and national levels.]

(a) Financing and cost evaluation

18. [The estimated average annual cost of this programme area could be upwards of $14 billion, of which it is estimated that about $130 million would come from international financing sources.]

(b) Scientific and technological means

19. Well-coordinated multidisciplinary efforts involving cooperation between scientists, financial institutions and industries will be required. At the global level, this may mean collaboration between research institutions in different countries, with funding at the intergovernmental level, possibly supported by similar collaboration at the national level. Research and development support will also need to be strengthened, together with the mechanisms for providing the transfer of relevant technology.

(c) Human resource development

20. Training and technology transfer is needed at the global level, with regions and countries having access to, and participation in exchange of, information and expertise, particularly indigenous or traditional knowledge and related biotechnology. It is essential to create/enhance endogenous

capabilities in developing countries to actively participate in the processes of production in biotechnology. The training of personnel could be undertaken at three levels:

(a) That of scientists required for basic and product-oriented research;

(b) That of health personnel (to be trained in the safe use of new products) and of science managers required for complex intermultidisciplinary research;

(c) That of tertiary-level technical workers required for delivery in the field.

(d) Capacity-building

21. See programme area E.

C. Enhancing protection of the environment

Basis for action

22. Environmental protection is an integral component of sustainable development. The environment is threatened in all its biotic and abiotic components: animals, plants, microbes and ecosystems comprising biological diversity; water, oil and air, which form the physical components of habitats and ecosystems; and all the interactions between the components of biodiversity and their sustaining habitats and ecosystems. With the continued increase in the use of chemicals, energy and non-renewable resources by an expanding global population, associated environmental problems will also increase. Despite increasing efforts to prevent waste accumulation and to promote recycling, the amount of environmental damage caused by overconsumption, the quantities of waste generated and the degree of unsustainable land use appear likely to continue growing.

23. The need for a diverse genetic pool of plant, animal and microbial germ plasm for sustainable development is well established. Biotechnology is one of many tools that can play an important role in supporting the rehabilitation of degraded ecosystems and landscapes. This may be done through the development of new techniques for reforestation and afforestation, germ plasm conservation, and cultivation of new plant varieties. Biotechnology can also contribute to the study of the effects exerted on the remaining organisms and on other organisms by organisms introduced into ecosystems.

Objectives

24. The aim of this programme is to prevent, halt and reverse environmental degradation through the appropriate use of biotechnology in conjunction with other technologies, while supporting safety procedures as an integral

component of the programme. Specific objectives include the inauguration as soon as possible of specific programmes with specific targets to:

(a) Adopt production processes making optimal use of natural resources, by recycling biomass, recovering energy and minimizing waste generation;

(b) Promote the use of biotechnologies, with emphasis on bio-remediation of land and water, waste treatment, soil conservation, reforestation, afforestation and land rehabilitation;

(c) Apply biotechnologies and their products to protect environmental integrity with a view to long-term ecological security.

Activities

(a) Management related

25. Governments at the appropriate level and, where necessary, with the assistance of international and regional organizations, the private sector, non-governmental organizations and academic and scientific institutions should:

(a) Develop environmentally sound alternatives and improvements for environmentally damaging production processes;

(b) Develop applications to minimize the requirement for unsustainable synthetic chemical input and to maximize the use of environmentally appropriate products, including natural products (see programme area A);

(c) Develop processes to reduce waste generation, treat waste before disposal and make use of biodegradable materials;

(d) Develop processes to recover energy and provide renewable energy sources, animal feed and raw materials from recycling organic waste and biomass;

(e) Develop processes to remove pollutants from the environment, including accidental oil spills, where conventional techniques are not available or are expensive, inefficient, or inadequate;

(f) Develop processes to increase the availability of planting materials, particularly indigenous varieties, for use in afforestation and reforestation and to improve sustainable yields from forests;

(g) Develop applications to increase the availability of stress-tolerant planting material for land rehabilitation and soil conservation;

(h) Promote the use of integrated pest management based on the judicious use of bio-control agents;

(i) Promote the appropriate use of bio-fertilizers within national fertilizer programmes;

(j) Promote the use of biotechnologies relevant to the conservation and scientific study of biological diversity and the sustainable use of biological resources;

(k) Develop easily applicable technologies for the treatment of sewage and organic waste;

(l) Develop new technologies for rapid screening of organisms for useful biological properties;

(m) Promote new biotechnologies for tapping mineral resources in an environmentally sustainable manner.

(b) Data and information

26. Steps should be taken to increase access both to existing information about biotechnology and to facilities based on global databases.

(c) International and regional cooperation and coordination

27. Governments at the appropriate level, with the support of relevant international and regional organizations, should:

(a) Strengthen research, training and development capabilities, particularly in developing countries, to support the activities outlined in this programme area;

(b) Develop mechanisms for scaling up and disseminating environmentally sound biotechnologies of high environmental importance, especially in the short term, even though those biotechnologies may have limited commercial potential;

(c) Enhance cooperation, including transfer of biotechnology, between participating countries for capacity-building;

(d) Develop appropriate safety procedures based on programme area D, taking account of ethical considerations.

Means of implementation

(a) Financing and cost evaluation

28. [The estimated average annual cost of this programme area could be upwards of $1 billion, of which it is estimated that about $10 million would come from international financing sources.]

(b) Scientific and technological means

29. See paragraphs 25-27 above.

(c) Human resource development

30. The activities for this programme area will increase the demand for trained personnel. Support for existing training programmes needs to be increased, for example, at the university and technical institute level, as well as the exchange of trained personnel between countries and regions. New and additional training programmes also need to be developed, for example, for technical and support personnel. There is also an urgent need to improve the level of understanding of biological principles and their policy implications among decision makers in Governments, and financial and other institutions.

Capacity-building

31. Relevant institutions will need to have the responsibility for undertaking, and the capacity (political, financial and manpower) to undertake, the above-mentioned activities and to be dynamic in response to new biotechnological developments (see programme area E).

D. Enhancing safety and developing international mechanisms for cooperation

Basis for action

32. [There is a need for internationally agreed principles and technical guidelines, which should build upon those already developed at the national levels. Only when adequate and transparent safety and border-control procedures are in place, will the community at large be able to derive maximum benefit from, and be in a much better position to accept the potential benefits and risks of, biotechnology. [Several fundamental principles could underlie many of these safety procedures, including: primary consideration of the organism, including the genetically modified organism; appropriate application of the step-by-step and case-by-case concept; complementary consideration of risk assessment and risk management; classification into contained use or release to the environment; and a framework for safety in biotechnology.] [Primary bio-safety considerations with respect to genetically modified organisms should build on the principle of familiarity with those organisms and apply a flexible framework of bio-safety guidance. Bio-safety considerations should be based on the identification of hazard; scientific assessment of risk; the level of containment or, for releases, the local environment; and alternatives for risk management.]]

Objectives

33. The aim of this programme area is to ensure safety in biotechnology development, application, exchange and transfer through an international

agreement on principles to be applied on risk assessment and management, 1/ with particular reference to health and environmental considerations, including the widest possible public participation and taking account of ethical considerations.

Activities

34. The proposed activities for this programme area call for close international cooperation. They should build upon planned or existing activities to accelerate the environmentally sound application of biotechnology, especially in developing countries. 1/

(a) Management-related activities

35. Governments at the appropriate levels and [, where necessary], with the support of relevant international and regional organizations, the private sector, non-governmental organizations, academic and scientific institutions, should:

(a) Make the existing safety procedures widely available by collecting the existing information and adapting it to the specific needs of different countries and regions;

(b) Further develop, as necessary, the existing safety procedures to promote scientific development and categorization in the areas of risk assessment and risk management (information requirements; databases; procedures for assessing risks and conditions of release; establishment of safety conditions; monitoring and inspections; taking account of ongoing national, regional and international initiatives, avoiding duplication wherever possible);

(c) Compile, update and develop compatible safety procedures into a framework of internationally agreed principles to be applied on safety in biotechnology [as a basis for the development of an international [legal instrument] [code of conduct], taking into account decision 1/17 adopted by the Preparatory Committee at its first session], and promote information exchange as a basis for further development, drawing on the work already undertaken by international or other expert bodies;

1/ See research paper No. 55, entitled "Environmentally sound management of biotechnology: safety in biotechnology - assessment and management of risks" (February 1992), prepared by the United Nations Conference on Environment and Development secretariat to take account of comments made at the third session of the Preparatory Committee for the United Nations Conference on Environment and Development on part II of document A/CONF.151/PC/67, which incorporate the findings of the ad hoc workshop of Senior-Level Experts on Assessing and Managing Biotechnology Risks held in London in June 1991.

(d) Undertake training programmes at national and regional levels on the application of the proposed technical guidelines;

(e) Assist in exchanging information about the procedures required for safe handling and risk management and about the conditions of release of the products of biotechnology, and cooperate in providing immediate assistance in cases of emergencies that may arise in conjunction with the use of biotechnology products. 2/

(b) Data and information

36. See paragraphs 34 and 37.

(c) International and regional cooperation and coordination

37. Governments at the appropriate level, with the support of the relevant international and regional organizations, should raise awareness of the relative benefits and risks of biotechnology.

38. See paragraph 34. Further activities should include the following:

(a) Organizing one or more regional meetings between countries to identify further practical steps to facilitate international cooperation in bio-safety;

(b) Establishing an international network incorporating national, regional and global contact points;

(c) Providing direct assistance upon request through the international network, using information networks, databases and information procedures;

(d) [Preparing internationally agreed guidelines on safety in biotechnology releases, including risk assessment and risk management, liability and compensation.]

Means of implementation

(a) Financing and cost evaluation

39. [The estimated average annual cost of this programme area for the period 1993-2000 could be about $2 million, all of which would come from international sources.]

(b) Scientific and technological means

40. See paragraph 34.

2/ Appropriate cross-references to other parts of Agenda 21 will be inserted later.

(c) Human resource development

41. See paragraph 34.

(d) Capacity-building

42. [Adequate international technical and financial assistance should be provided and technical cooperation to developing countries facilitated in order to build up technical, managerial, planning and administrative capacities at the national level to support the activities in this programme area. See also programme area E.]

E. Establishing enabling mechanisms for the development and the environmentally sound application of biotechnology

Basis for action

43. The accelerated development and application of biotechnologies, particularly in developing countries, will require a major effort to build up institutional capacities at the national and regional levels. In developing countries, enabling factors such as training capacity, know-how, research and development facilities and funds, industrial building capacity, capital (including venture capital) protection of intellectual property rights, and expertise in areas including marketing research, technology assessment, socio-economic assessment and safety assessment are frequently inadequate. Efforts will therefore need to be made to build up capacities in these and other areas and to match such efforts with appropriate levels of financial support. There is therefore a need to strengthen the endogenous capacities of developing countries by means of new international initiatives to support research in order to speed up the development and application of both new and conventional biotechnologies to serve the needs of sustainable development at local, national and regional levels. National mechanisms to allow for informed comment by the public with regard to biotechnology research and application should be part of the process.

44. Some activities at the national, regional and global levels already address the issues outlined in programme areas A, B and C. Several others are related to programme area D, particularly with respect to the international codification of safety guidelines in biotechnology, and to the providing of advice to individual countries on the development of national guidelines and systems for the implementation of those guidelines. These activities are generally uncoordinated, however, involving many different organizations, priorities, constituencies, time-scales, funding sources and resource constraints. There is a need for a much more cohesive and coordinated approach to harness available resources in the most effective manner. [Research in biotechnology and the applications of its findings could have significant positive and negative socio-economic cultural impacts and should therefore should be carefully considered in the earliest phases of the development of biotechnology.]

Objectives

45. The objectives are to:

(a) Promote the development and application of biotechnologies, with special emphasis on developing countries, by:

(i) Enhancing existing efforts at national, regional and global levels;

(ii) [Mobilizing additional financial resources and instituting innovative financing mechanisms, as necessary for selected priorities, to address the specific needs of different regions or socio-economic conditions]; 3/

(iii) Providing the necessary support for biotechnology, particularly research and product development, at the national, regional and international levels;

(iv) Raising public awareness regarding the relative beneficial aspects of and risks related to biotechnology, to contribute to sustainable development;

(v) Helping to create a favourable climate for investments, industrial capacity-building and distribution/marketing;

(vi) Encouraging the exchange of scientists among all countries and discouraging the "brain drain";

(vii) Recognizing and protecting the traditional methods and knowledge of indigenous and local communities and ensuring their participation in the economic and commercial benefits arising from developments in biotechnology;

(b) Identify ways and means of enhancing current efforts, building wherever possible on existing enabling mechanisms, particularly regional, to determine the precise nature of the needs for additional initiatives, particularly in respect of developing countries, and develop appropriate response strategies, including proposals for any new international mechanisms;

(c) Establish or adapt appropriate mechanisms for safety appraisal and risk assessment at local, regional and international levels, as appropriate;

(d) [Consider extending legislation to include liability and compensation for social and environmental damage resulting from applications of biotechnology.];

3/ It has been proposed that this objective should be transferred to the Means of implementation section.

(e) [Encourage the consideration of appropriate cultural, social, ethical, and humane factors when undertaking the transfer or exchange of technologies.]

Activities

(a) Management-related activities

46. Governments at the appropriate level, [where necessary] with the support of international and regional organizations, the private sector, non-governmental organizations and academic and scientific institutions should:

(a) Develop policies and mobilize additional resources to facilitate greater access to the new biotechnologies, particularly by and among developing countries;

(b) Implement programmes to create greater awareness of the potential and relative benefits and risks of the environmentally sound application of biotechnology among the public and key decision makers;

(c) Undertake an urgent review of existing enabling mechanisms, programmes and activities at national, regional and global levels to identify strengths, weaknesses and gaps, and to assess the priority needs of developing countries;

(d) Define and implement strategies to overcome constraints identified in the areas of food, feed and renewable raw materials; human health; and environmental protection, building upon existing strengths;

(e) Undertake an urgent follow-up and critical review to identify ways and means of strengthening endogenous capacities within and among developing countries for the environmentally sound application of biotechnology, including, as a first step, ways to improve existing mechanisms, particularly at the regional level, and, as a subsequent step, the consideration of possible new international mechanisms, such as regional biotechnology centres;

(f) Develop strategic plans for overcoming targeted constraints by means of appropriate research, product development and marketing;

(g) Establish additional quality-assurance standards for biotechnology applications and products where necessary.

(b) Data and information

47. The following activities should be undertaken: facilitation of access to existing information dissemination systems, especially among developing countries; improvement of such access where appropriate; and consideration of the development of a directory of information.

(c) International and regional cooperation and coordination

48. Governments at the appropriate level, with the assistance of international and regional organizations, should develop appropriate new initiatives to identify priority areas for research based on specific problems and facilitate access to new biotechnologies, particularly by and among developing countries, among relevant undertakings within those countries, in order to strengthen endogenous capacities and to support the building of research and institutional capacity in those countries.

Means of implementation

(a) Financing and cost evaluation

49. [The estimated average annual cost of this programme area for the period 1993-2000 could be about $5 million, all of which would come from international financing sources. This does not include the costs of any innovative mechanisms arising from the implementation of this programme area.]

(b) Scientific and technological means

50. Workshops, symposia, seminars and other exchanges among the scientific community at regional and global levels, on specific priority themes, will need to be organized, making full use of the existing scientific and technological manpower in each country for bringing about such exchanges.

(c) Human resource development

51. Personnel development needs will need to be identified and additional training programmes developed at the national, regional and global levels, especially in developing countries. These should be supported by increased training at all levels, graduate, postgraduate and post-doctoral, as well as by the training of technicians and support staff, with particular reference to the generation of trained manpower in consultant services, design, engineering and marketing research. Training programmes for lecturers training scientists and technologists in advanced research institutions in different countries throughout the world will also need to be developed, and systems giving appropriate rewards, incentives and recognition to scientists and technologists will need to be instituted (see para. 50). Conditions of service will also need to be improved at the national level in developing countries to encourage and nurture trained manpower with a view to retaining that manpower locally. Society should be informed of the social and cultural impact of the development and application of biotechnology.

(d) Capacity-building

52. Biotechnology research and development is undertaken both under highly sophisticated conditions and at the practical level in many countries. Efforts will be needed to ensure that the necessary infrastructure facilities for research, extension and technology activities are available on a

decentralized basis. Global and regional collaboration for basic and applied research and development will also need to be further enhanced and every effort should be made to ensure that existing national and regional facilities are fully utilized. Such institutions already exist in some countries and it should be possible to make use of them for training purposes and joint research projects. Strengthening of universities, technical schools and local research institutions for the development of biotechnologies and extension services for their application will need to be developed, especially in developing countries.